It takes
LESS EFFORT
to win sales

Will your company lose sales by failing to reduce the human effort it takes to manufacture your product? To service that product? To *use* it?

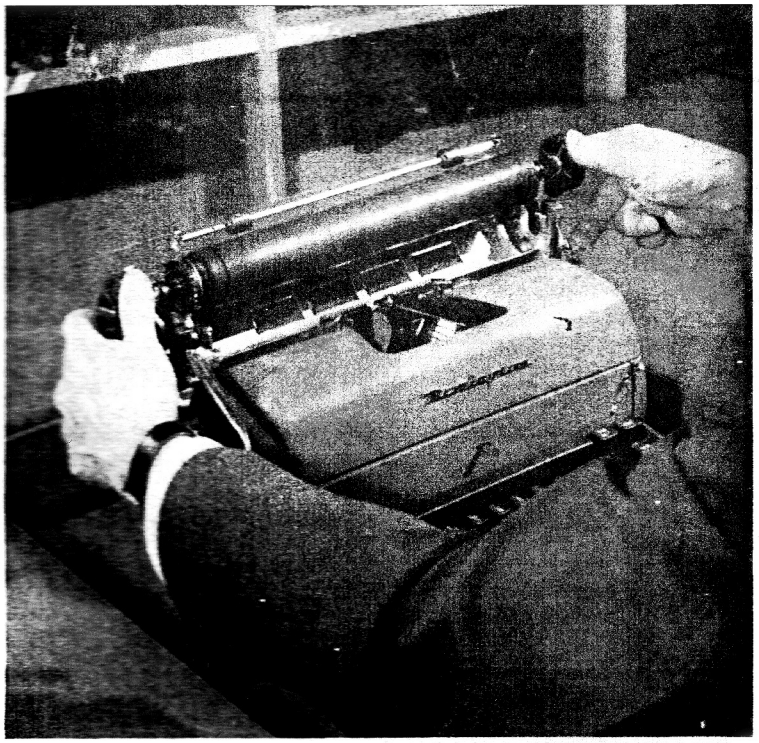
The answer will be "Yes" — unless your company joins other progressive firms now making an intensive drive to squeeze waste effort out of their product designs. They're stopping waste effort dead in its tracks right on the drawing board — where such waste is born more often than killed.

It's simply, say executives of these firms, a matter of encouraging designers to consider more fully the men and women who make, service, or use their products.

Waste effort is built into all sorts of products — even 1950-style models for plant, office, farm, and home. "Countless designs," says Prof. David Porter, of New York University, "reflect a great violation of motion-economy principles." The cost of this waste, to industry alone, is prodigious.

It's the kind of waste found in hundreds of plants where oper-

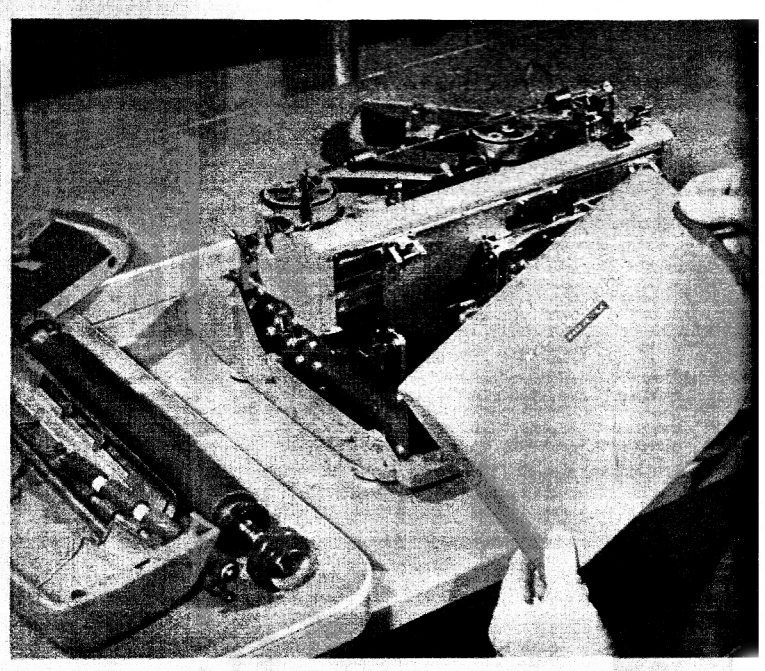
continued on page 40



IT TAKES LESS TIME to remove cylinder than to type "quick brown fox."

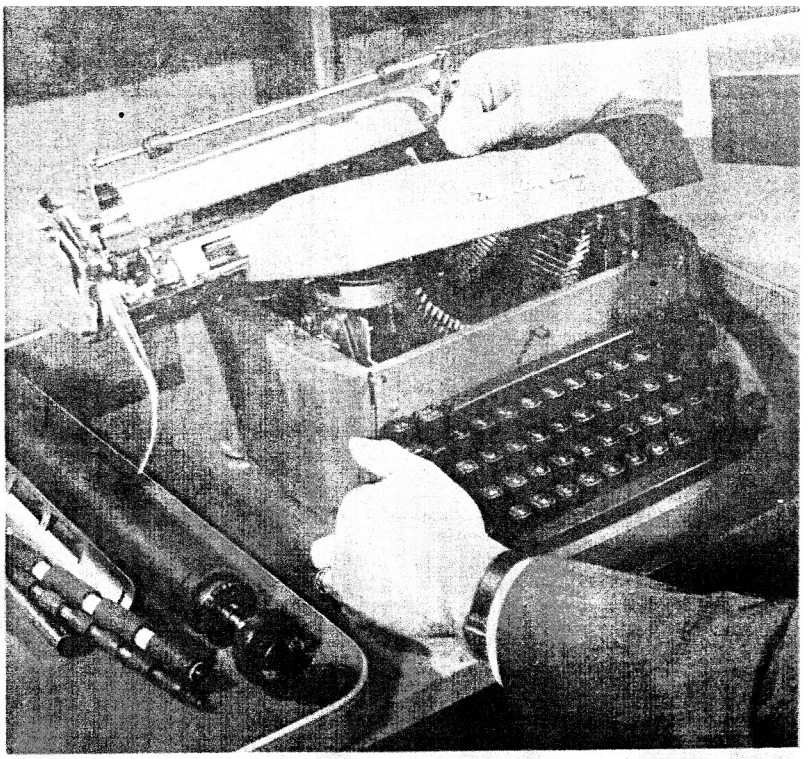
DESIGN FOR QUICK GET-AT-ABILITY— BY REMINGTON RAND

BOTH SIDE COVERS snap off, with only an effortless two-hand movement.



ENTIRE HOUSING is completely out of the way with back cover detached.

PER DEFLECTOR, feed rolls too, are readily lifted out — in a jiffy.



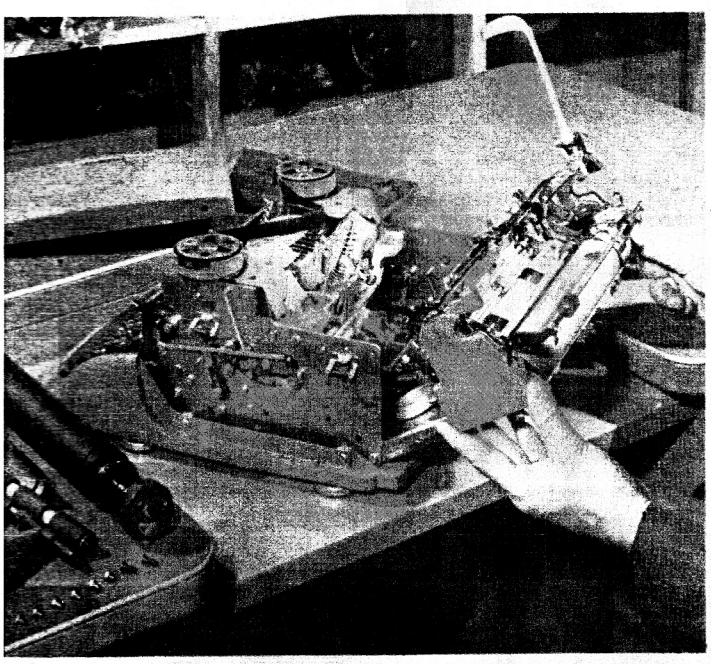
FRONT COVER PLATE, held firm by pin-type clips, is pulled off easily.

asier access for cleaning and minor adjustments to maintain a
writer at performance peak. That's provided by revolutionary
gn improvements shown in these pictures of Remington Rand's
"Super-riter." Timesaving and effortsaving ideas built into this
writer were culled from countless field and laboratory studies
rpists in action.
hey carry a story of significance to those who design, make, sell,
uy equipment for plant, office, or home.
hey typify a steady trend toward the development of products that make work for people as effortless and economical as possible.

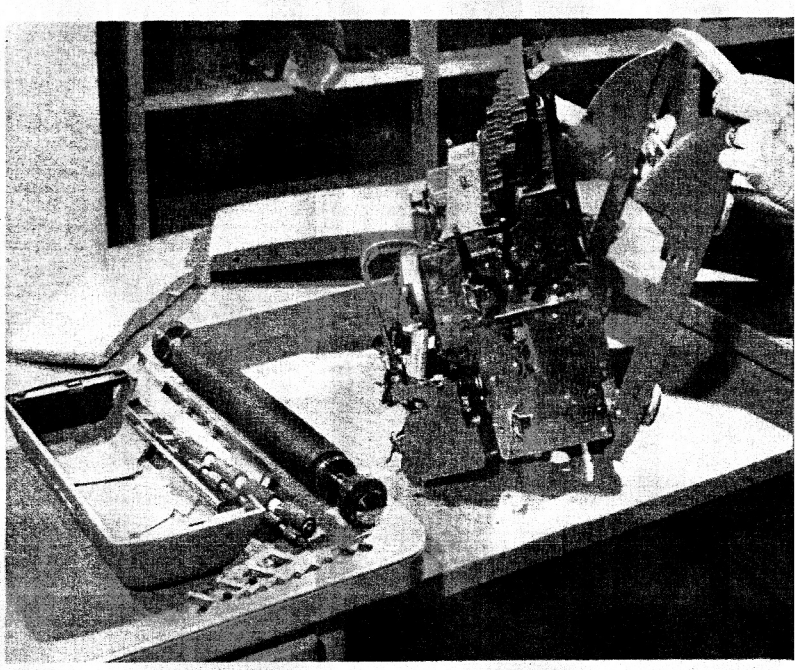
It's a trend speeded both by growing sales aggressiveness and sharper consumer demands.

In brief, machines that do a better job of *increasing the productivity of people* point the way for many companies to meet the needs and seize the opportunities of The Competitive 50's. To turn out such machines calls for teamwork — bringing into play top management, sales, design, and production. At Remington Rand it produced the Super-riter.

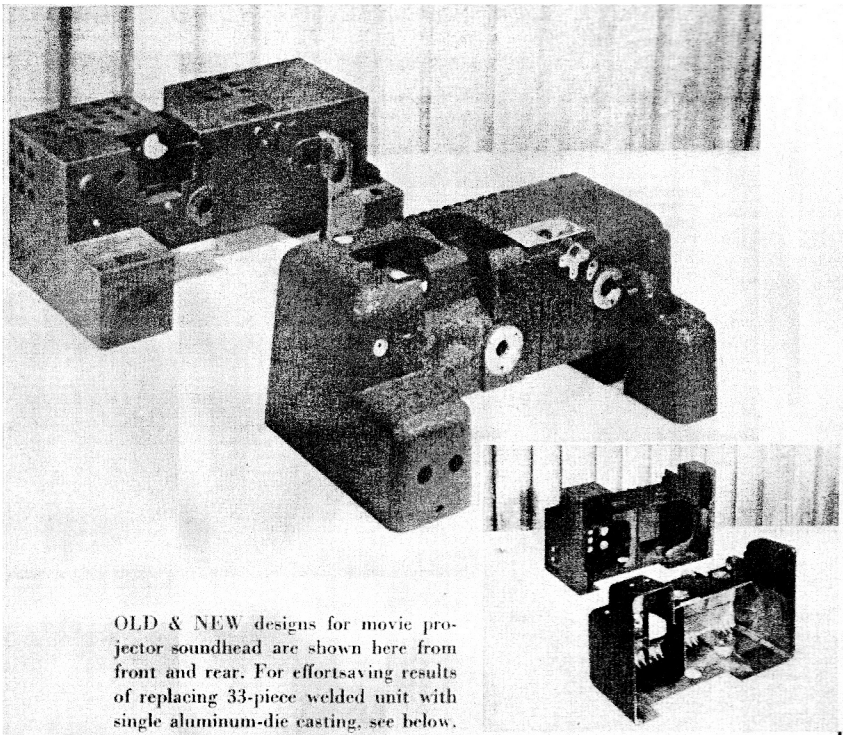
MORE EFFORT-SAVING IDEAS ON FOLLOWING PAGES



TH SIX SCREWS removed, carriage folds back for cleaning or service.



FINALLY, four small bolts are taken out and frame is freed from machine.



OLD & NEW designs for movie projector soundhead are shown here from front and rear. For effortsaving results of replacing 33-piece welded unit with single aluminum-die casting, see below.

Design for motion economy pays off in production

Good example of applying motion-economy thinking to products at the drawing board shows up in Bell & Howell's 16-mm. "Filmosound" projector. Here, designers sought not only to create a product that would be easier to use but also a product that would be easier to make.

On one part of the projector — the soundhead pictured above — a switch from the old 33-piece, welded-steel unit to the new single-piece, aluminum-die casting gives these results:

Fabricating operations reduced from 45 to 21; three of the four original inspections eliminated; standard cost cut 27%.

Single supplier now

Added to these direct-saving benefits are further economies in simplified purchasing and stock records. Where formerly three suppliers furnished the 33 parts, now only one is needed.

The new casting makes it easier to plan and schedule machining tasks. Line production methods are adopted. Machine setup time is slashed. Machining errors are far fewer.

All these manufacturing advantages are obtained with a single design change that at the same time improves the product.

Talking points for salesmen

The new casting decreases weight of the projector by about 3 lb., makes the machine easier to use. It gives the Filmosound unit a neater appearance as compared with previous models. To B & H's sales department, the combination of a better product and lower cost — from motion-economy-minded designing — brings distinct advantages in a highly competitive field.

An official at Bell & Howell's executive offices in Chicago says: "One of our prime engineering objectives is to make equipment that's easy to use . . . and motion economy is a prime consideration in designing it."

ators of machines must reach too far for a control lever. They must stoop uncomfortably to turn a handwheel. They must take extra fatiguing steps to set up equipment and keep it running.

This kind of waste is found in assembly where — despite the best efforts of motion-economy-minded engineers — millions of man-hours and dollars are lost because designers of the parts assembled have paid little heed to the human factor.

Every management man knows that the principles of motion economy are applied with success to widely different tasks. Really immense results in saving human effort (and dollars) are gained by rearranging workplaces for assembly jobs so that more productivity for equal effort is obtained. By rearranging machine layouts to reduce nonproductive movements of men as well as materials. By simplifying office and administrative procedures to improve performance of people — from clerks to top executives.

Why it hasn't received more attention

But not so generally realized is the fact that very little progress has been made in applying motion-economy principles to product design where the payoff — in sales and costs advantages — can be equally handsome. Why so little progress? The main reasons boil down to four:

1. Customers don't sound off loudly enough about the motion-economy shortcomings of products they buy and use.
2. Salesmen gloss over the "human" advantages of the products they offer, put stress instead on strictly mechanical advantages.
3. Designers are not exposed fully to the principles and possibilities of motion economy, thus fail to take them into full account in their creative work.
4. Top-management men fail to see the "light" because the dollars-and-cents potential in this approach isn't made clear.

Hosts of other factors account for violation of motion-economy principles in product design.

They range from mere iron-bound tradition to restrictions imposed on designers by the urgency of meeting customer price and delivery demands.

Against this background, one fact stands out: From now on more and more companies will make "less effort" a prime ingredient of the products they sell. The customer is King again. No matter what he buys — machine tool, business machine, tractor, dishwasher, or power lawn mower — he'll insist on features that *save* effort.

Typical of today's attitude of industrial purchasers is this comment to MI editors by E. H. Eige, of Western Electric: "So far as possible, we utilize standard types of machinery available on the open market. Obviously, there is always a selection. Our engineers have uppermost in their minds the matter of human efficiency when selecting equipment of this type for any purpose. Furthermore, we conduct a very active program of motion-economy training within our engineering and design organization, constantly impressing upon the minds of the men in this group the importance of giving human efficiency full consideration."

Design engineers went back to school

Good example of selling designers the need to build manufacturing motion economies into their designs is found at Glenn L. Martin Co., Baltimore. Here, conspicuous savings in production costs result from shop-familiarization courses for engineers and draftsmen.

To promote more economical designs, the course puts shop know-how directly into design engineers' hands. It involves evening lectures, visits to the shop for demonstrations. Too, members of the group wherever possible tackle such tasks as milling, welding, and explosive riveting.

This Martin course is only one of many practical devices for

ouraging designers to avoid product specifications that call needless and expensive effort from both the people and the chines that make the product.

Design changes in products of Friden Calculating Machine Co., ., San Leandro, Calif., make time and dollar savings by permitting use of more-modern production facilities. For example, culator key tops and control bars formerly were single-injection lded with recessed figures tediously filled in by hand with contrasting paint. Now — with a double-injection-molding machine plastic of contrasting color is forced into recesses outlining numerals to make a smooth flush surface.

Idea that brought 50% output jump

Brought to the attention of MI editors recently was a case that, principle, indicates how countless dollars in savings could be ade — but unfortunately are not — at the drafting board.

The case involves a part with six studs. When this part first the shop, girl assemblers threaded tiny nuts on the studs. ey used only one hand in a painfully slow operation. A methods-provement man soon converted this task to a two-hand setup. ter, someone in the shop asked whether the tip ends of the studs d any functional value. They did not. So threaded ends were rned down to provide a pilot on which assemblers could quickly sition each nut and spin it snugly into place. With this simple ange, output was jumped about 50%.

It could have been made *originally* by the designer.

At the Maytag Co., Newton, Iowa, an active Work Simplification program brings from employees a steady parade of costsavers product design. Some save thousands of dollars annually. hers, though not spectacular, pile up important economies. For itance, $420 is saved yearly from the suggestion by a supervisor at eliminates a hole drilled in a rod for a cotter pin. Flanging er the end of the rod now serves the same purpose.

Exposure to Work Simplification — and its teaching of motion-onomy principles and techniques — helps product engineers at rvel, Inc., Evansville, Ind., to propose better designs.

Making everyone aware of possibilities

According to Work Simplification Director Herman A. Straus, it so puts a way of thinking into the minds of Servel's tool engiers that leads to superior tools, jigs, and fixtures. Moreover, ch exposure for foremen brings suggestions for product-design anges resulting in costsaving motion economies in the shop.

For instance, Straus says, "One foreman in our plant was having nsiderable trouble reworking a certain unit. He tried everying he knew to get rid of the difficulty. He found nothing, and cided to live with that trouble as long as the product was with m. After Work Simplification, he tackled it again. From his stematic approach, he came up with a *change in product design* at got rid of his trouble and saved Servel $8,000 a year."

Servel's entire top-management team had the same exposure as ie foreman. Sixteen high officials, including Board Chairman uthenburg, attended 12 three-hour sessions conducted by Dr. Marvin Mundel, of Purdue University. Thus top understanding of Work Simplification — bringing upper-echelon support to motion-conomy thinking and action — is developed.

From the standpoint of the user, attention to the human factor y designers is bringing vastly improved products such as typeriters (pp. 38-39), motion-picture projectors (p. 40), and machine ols (at right and on p. 42).

Design changes add operator convenience to new models of food achines by Toledo Scale Co. For instance, on Toledo's steak achine, the cutting mechanism may be removed as a unit for leaning. On earlier models, cutting rolls and guides had to be isassembled piecemeal.

New products of Underwood Corp., New York, incorporate principles of motion economy. Its Sundstrand Cycle Billing Machine — which automatically posts statements and ledger cards — has its 10 numeral keys in an area only 2 by 3 inches to facilitate keyboard operation with minimum hand travel.

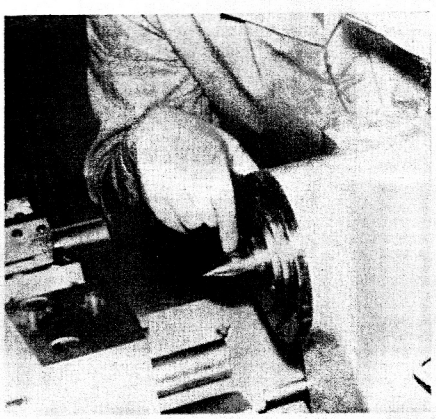
Though some machine tools leave much to be desired in this regard, there's plenty of evidence to show tremendous advances. Builders of machine tools are increasingly building waste effort out of their equipment. Coming under closer scrutiny are ways to perform several motions simultaneously instead of separately; to centralize controls; to save operator steps; and to reduce fatigue of hand operations through the use of power. (See "Winning product sales with motion study," MI, 7/15/46.)

Marvin Mundel, Professor of Industrial Engineering at Purdue, suggests two motion-economy tools for pretesting designs of machinery while they're still on the drawing board. One is a man-

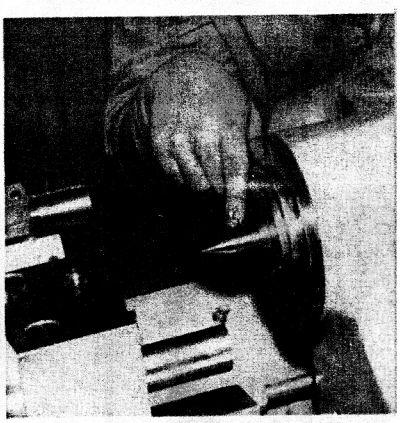
MORE EFFORT-SAVING IDEAS ON FOLLOWING PAGE

Motionsavers by Gisholt Machine

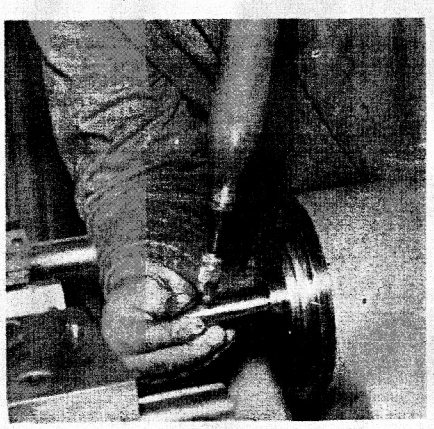
Designers of shop machinery now give more attention to minimizing operator waste effort — a fact typified by features built into products of Gisholt Machine Co., Madison, Wis. These features range from "gimmicks" (below) to complete push-button control. For instance, a push-button station on one 1950 Gisholt eliminates stooping or reaching for cranks and levers used on older models.



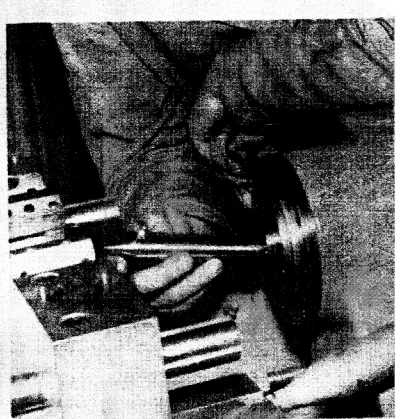
PIPE PLUG, recessed in snug-fitting tailstock center on Gisholt automatic lathe, is clue to slick effortsaving idea.



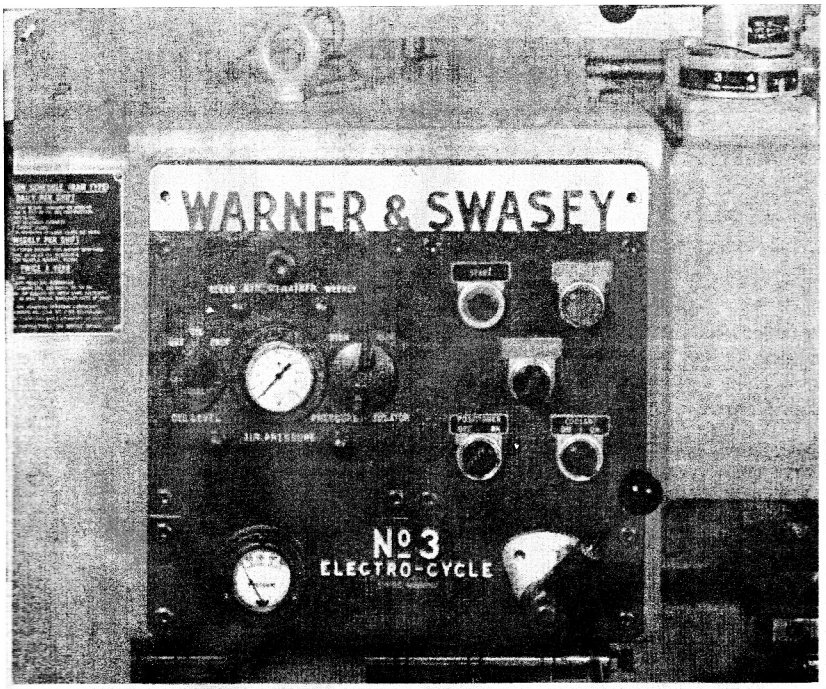
PRESSURE FITTING, put in place of pipe plug, is ready for ordinary hand-type grease gun.



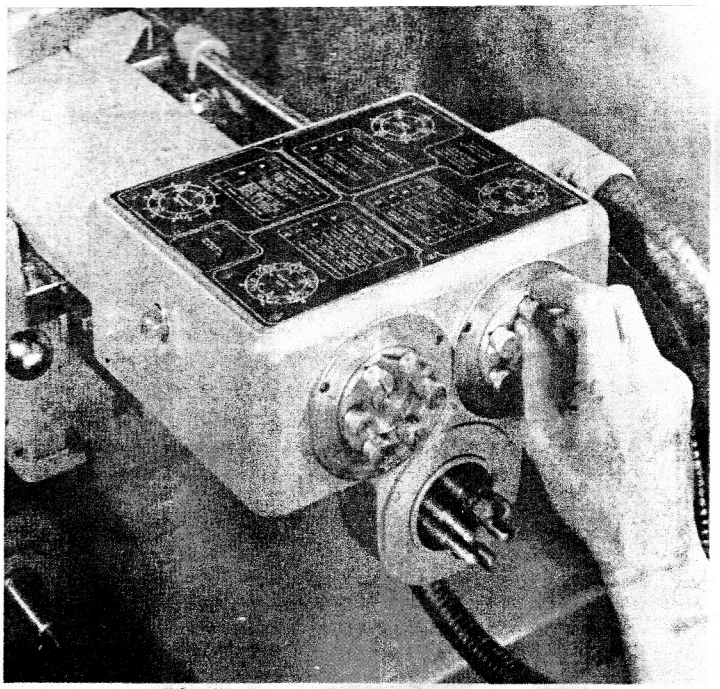
ONLY A FEW STROKES of gun are needed to force grease into hole that runs through to end, thus easily eject center.



REMOVING center, ordinarily a tedious task that occurs often where work varies, is now quick.



TO REDUCE HANDLING, lift productivity of turret lathe, this Warner & Swasey Electro-Cycle Control eliminates manual operation of headstock.



AUTOMATIC CONTROL for turret on W & S lathe allows operator to preset machine for complete cycle of work by adjusting knurled knobs.

LESS EFFORT *continued*

machine operation chart for listing in sequence the individual human motions involved in using the equipment for a specific task.

The other is an articulated human template — made to scale in plan and profile views — which is placed on similar scale views of the machine itself. The template is moved into positions that conform with each step on the man-machine chart. Each position is studied against a checklist of points, such as location of controls and workplace height. Thereby the designer has a better opportunity to catch and correct human deficiencies of the machine *before* it is built.

Discovering relation of detail motions, machine operation

Another preplanning aid for machine design is a slide-rule type man-machine cyclograph developed by J. G. Surmacz, chief industrial engineer, Ingersoll Steel Div., Borg-Warner Corp., Chicago.

It provides a ready way to visualize detail motions and their relation to machine functioning.

To the growing fund of facts on man-machine relationships, colleges and universities add a big share. This exploration and fact-finding is done not alone by engineering departments but also by psychology and medical professors and their students.

For instance, at Mount Holyoke College, South Hadley, Mass., a Navy-financed project concentrates on human behavior as it relates to design of radar and other military electronic devices. This work is done under a subcontract with Johns Hopkins University, Baltimore, which is actively researching the subject.

The University of California, Berkeley, is working on fundamental experiments in this area. One of the most recent reports from U. of C. by Professor Louis E. Davis deals with human factors in the design of manual machine controls. Data secured in his study should be helpful to designers for deciding on type and location of controls (such as handwheels, cranks, and crossbars) for optimum operation.

A three-year project begun in 1949 at Harvard's School of Public Health shows how industry is enlisting psychologists for research that will lead to effortsaving product improvements. The study is known as "The Highway Transport Research Project." It is financed by the National Assn. of Motor Bus Operators, the American Trucking Assn., and the Liberty Mutual Insurance Co. It aims to reduce accidents.

Important elements of the study are: (1) design of equipment in relation to the human factor; and (2) job analysis of bus and truck-driver operations.

A typical finding: Records show that trucks parked on highways are in many serious accidents, and that often they occur before warning flares are set.

With this as a lead, examination of certain trucks reveals that flares are carried in a place almost inaccessible to the driver. So it takes the driver too long to dig out flares and set them; or he decides it's too much trouble, and ignores them.

Similarly, designers of other products — glossing over the human factor — fail to consider accessibility. Examples are legion, ranging from hidden lubrication points on machinery to a shut-off valve placed where it takes a stepladder to reach it.

For such oversights, companies pay and pay.

Costly human errors — responsible for accidents, product damage, or misleading accounting figures — are, again, made less likely through designs that fully consider the human factor.

Psychology plays big part in effective safeguards

Here, the psychologist also begins to assume an increasingly helpful role for the designer (see "Using psychology in product design," MI, 4/15/48). For the psychologist is forcing attention — as well as revealing highly useful facts — on such matters as legibility of dials, visibility, accessibility, human limits, and reachability.

When more attention is paid to these things, there'll be fewer products that — despite much mechanical efficiency — have built-in waste effort.

With the human being brought into the designer's mind in these ways, a whole new field of opportunity opens for industry to: (1) Take a deeper bite into production costs; and (2) build new customer-winning appeal into products.

For every company that aims for these benefits, through humanizing its product, the most important step is to "go to the person who uses it day in and day out."